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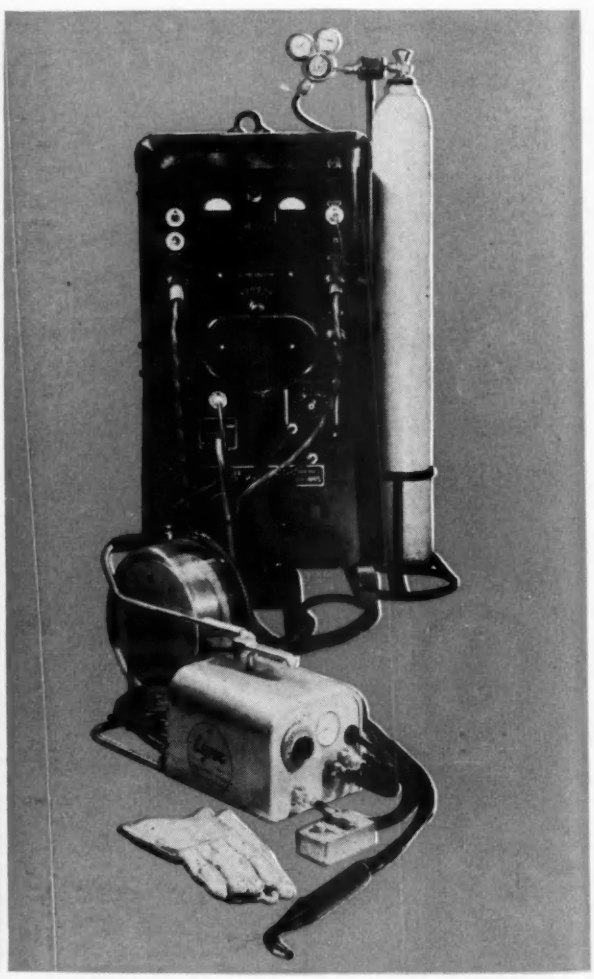

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Gas Journal

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WEDNESDAY, DECEMBER 13, 1961

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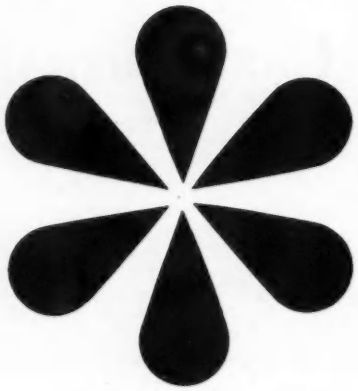

A Statement of Policy by the Board of Parkinson Cowan Gas Meters

Meters are the ultimate cash registers of the Gas Industry. Gas meters however are not "absolute" devices and are prone to small but systematic errors. The money cost of these errors can, in extreme cases, be of a comparable order of magnitude to the profit and losses of the Undertaking.

A cashier who abstracts money from the till is not tolerable at any price. Any proved improvement in gas meters which can be shown to increase their stability and accuracy is no matter of minor technical interest, but is a significant contribution to the financial control and profitability of the Industry.

Causes of inefficient metering

Parkinson Cowan has devoted many years of research to correct a tendency from which all gas meters suffer—a reduced stability with age—which generally takes the form of slow registration.

The primary cause of this is now known with certainty. It is the "migration" of lubricants used in bearings and gearboxes and their change in nature by coming in contact with gas impurities. One effect of this is that the valves become sticky, which increases the mechanical load on the meter. Another effect is that corrosion and accelerated wear is set up in working parts.

A technical breakthrough

Ten years ago we concluded that grease must be abolished from meters, and we introduced industrial meters with dry lubricated bearings. In all this time not one single bearing has been found to fail.

We have now decided to introduce the same technique into all domestic meters. The tests have shown that the dry lubricated bearings made from a compound of graphite and a nylon polymer produced from a vegetable basis, has achieved not simply a diminution of wear but a virtual abolition of detectable wear after the equivalent of thirty years of running life.

This is a technical breakthrough. It will affect profoundly the cost of metering by greatly reducing maintenance. It will affect the revenue of the Gas Industry to a significant amount, and it will set a new standard for gas meter performance.

These are the reasons why we are confident of the future of dry lubrication.

Parkinson Cowan PC

PCGM18

Gas Journal

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Are plastic services any nearer?

WE particularly welcomed the paper on the use of PVC pipes in the gas industry presented by Mr. W. F. Gardner and Mr. I. Kalushner, both of the South Eastern Gas Board, to the recent Autumn Research Meeting of the Institution.

To some perhaps the British gas industry's view on the suitability of plastic pipes for gas distribution may seem to be ultra conservative in view of the great increase in their use on the Continent, especially in Holland where it appears that no trouble arising from the deterioration of the pipe wall has been encountered.

The case in favour of some material other than the conventional steel tube for service pipes seems a strong one, particularly now that the cost of the labour needed to replace services accounts for by far the greatest proportion of the money spent on this particular item of maintenance. It must also be borne in mind that the number of services renewed each year may be as many as 90,000 in some board areas.

In an effort to avoid blockage and external corrosion of the steel service pipe, it is now customary to treat the bore with red lead paint and wrap the exterior with suitable tape. Though the cost of materials, including the steel tube, is small in proportion to the total cost, the actual cost of preparing the tube may be considerable. Moreover, this procedure is at best only a means of delaying its ultimate deterioration. A suitable pipe made of some chemically inert material is needed, a material which is completely unreactive to the gas it carries and unaffected by the ground in which it is laid, however aggressive it may be. This material, too, must have reasonable physical strength to withstand the burden of the compressed soil above it and the increasingly heavy traffic which may be running over the line of the pipe. Lastly, constituents of the gas must not affect these physical characteristics of the material.

The investigation carried out by the authors was essentially to enquire into the conditions under which certain constituents of town gas would in fact react with unplasticised polyvinylchloride pipe. Needless to say, extreme concentration of the aggressive constituents was used in order to establish the effect of their presence on the pipe. The proportion of constituent absorbed was measured under the predetermined temperature conditions with equilibrium established, and changes in tensile strength before and after treatment could then be measured.

The authors established that aromatic hydrocarbons were more aggressive—especially derivatives with an unsaturated side chain—than aliphatic hydrocarbons. Cyclic paraffins were also inert, though the presence of a double bond caused some activity.

This is, we feel, a nice exercise in applied research that will make available knowledge for those distribution engineers who are contemplating laying trial PVC services in their areas and will assist considerably in the forecasting of the condition of the tubing after it has carried considerable quantities of gas. It is not, however, a field test in the real meaning of the word.

For this we must await reports on lengths of PVC pipe actually laid as services by the South Eastern Gas Board. This particular Board seems to have shown a good deal of interest in the material, but as yet there seems little positive or practical information available. That some such material as this will be adopted for services and even for mainlaying in the next decade is, we feel, fairly certain, but though the plastic manufacturers are clearly responsible for developing new types of material, it is ultimately only the gas industry itself which can select the most suitable type to use.

In the discussion that followed the paper, contributors from the plastics industry took part including a research chemist from the I.C.I. plastics division, and therefore a representative of the manufacturers of the raw material, a chemical product. So here were the three interested parties, the chemist, the manufacturer of the article and the user of the final product. It may be a little difficult, however, to judge which will have the most influence in finally reassuring the industry that it is safe to adopt plastic service pipes forthwith.

Though the present paper has much to say on the chemical aspect of the suitability of the PVC used, it naturally makes no comment on the availability of suitable fittings to improve the mechanics of pipe-laying and plastic-to-metal joints, which the manufacturers will have to make available. But the user—the distribution engineer—should be only too delighted to change over to PVC as soon as he is assured of a suitable tube and a good supply of fittings as he can now expect from the steel tube suppliers. But how soon will that be? We hope in a very few years.

The passing of No. 25

THE news this week of the retirement of the last of the North Thames Gas Board's 'Jumbo' class locomotives will arouse the interest of that devoted band of enthusiasts who revere aged machinery with much the same adulation as teenagers feel for pop singers. Even we, who do not subscribe to this cult, feel a slight twinge of nostalgia since on one never-to-be-forgotten occasion we rode on the footplate of No. 25, this same stubby and eccentrically attractive old thing which, at the respectable age of 65, is being presented to the museum of the Bluebell Line at Sheffield Park, Sussex. It seems a mite insulting to move her to this vehicular Valhalla by articulated lorry.

Although in recent months she has been on loan to Southall, No. 25 spent almost all her working life at Beckton. Built in Glasgow by Neilson and Company in 1896 for the Gas Light and Coke Company, she was in fact specially designed for work at Beckton. For the low height and the semi-circular saddle tank which gave the 'Jumbo' locos their characteristic appearance enabled them to be run right into the coke holds in the retort houses. (Just as a matter of interest we recall that Old Number One, which was no less than 83 years old when we clambered aboard back in 1953, had the distinction of possessing a tank beneath the boiler—a refinement apparently denied such young upstarts as No. 25.)

Another special feature of the 'Jumbo' loco is the massive buffer at either end. This enabled the loco to be coupled to trucks of varying heights and it could thus be used for both main line and works trucks.

How times change! We have just been looking at a photograph of the newly acquired King's Meadow extension to the Southern Gas Board's Reading works—and guess what! All the shunting of railway wagons is being done by a Bray loading shovel which doubles this job of acting task elephant with its normal function. No wonder the likes of No. 25 are creeping off into steamy retirement.

World Power papers

PERUSAL of the list of papers to be presented by the British National Committee at the sixth plenary meeting of the World Power Conference at Melbourne next October reveals fairly strong gas participation. There are in fact three papers by members of the British gas industry, presented by eight of our top technical people.

The subject of methane importation does not figure among the subjects covered, but coal and oil gasification receive a paper each. Dr. F. J. Dent, Director of Research at the Midlands Research Station, Mr. T. S. Ricketts, Chief Engineer of the Scottish Gas Board, and Dr. M. Maccormac, of the London Research Station, join forces to present, 'Coal Gasification in Great Britain.' Other feedstocks are represented by Mr. J. E. Davis, Chief Technical Officer of the South Eastern Gas Board, and Mr. D. R. Coote, Senior Assistant Engineer of the North Thames Gas Board, whose subject is 'Production of Town Gas from Oil and Hydrocarbon Gases.' Meanwhile gas utilisation is propounded by Mr. R. F. Hayman, Industrial Gas Officer, Gas Council, Mr. W. A. Simmonds, of the Midlands Research Station, and Mr. G. H. Fuidge, Manager of the South Eastern Gas Board's Central Laboratories; their subject is 'Recent Developments in the Use of Gas in Industry.'

As we have said, these are the papers originating from the gas industry, but of the 22 papers there are several others which promise to be of considerable interest to us. For example, Dr. A. Parker is to submit a forecast of energy demands in the United Kingdom for the next ten years; Mr. P. T. Cox, Managing Director of B.P. Exploration Co. Ltd., is to compare the prospects of oil and natural gas; and Sir Harold Hartley, Technical Adviser to Constructors John Brown, is to make a comparison of costs of transportation of energy in different forms.

All told it promises to be a most interesting meeting. A pity it is to be held so far away!

Wales takes the cake

WITH Christmas in the air it is pleasant to be able to report a heart-warming story from Wales.

Some four years ago, it seems, the Wales Gas Board in conjunction with McDougalls, the flour manufacturers, sponsored a cake making competition. At the close of the competition, the Managers of the gas Undertakings at Barry and in the Rhondda Valley, suggested to the people who had entered that it might be a kind gesture that instead of taking their cakes away, they allowed the undertaking to distribute them to deserving people. From this beginning, in both places at Christmas time, a similar competition has been held and many hundreds of elderly and needy people have continued to benefit.

This year, for the first time, the idea has been extended to Wales as a whole, except that, instead of running it as a cake making competition, it has been called the 'Give A Cake' scheme. By Press and poster advertising, and also with the assistance of T.W.W. by television advertising, the public were invited to add a little extra to their own cake making ingredients and to make a cake which could be taken into any Wales Gas Board showroom for the week commencing December 4. The Wales Gas Board produced a little gift box which bore the donor's name and address and a brief message of good will for Christmas. The W.V.S. agreed to collect these cakes from all over Wales and to distribute them to the needy and deserving. Something like 4,000 cakes were expected.

The Prime Minister at the Lord Mayor's Banquet in London last month urged that this should be made an Old People's Christmas. The Board was so impressed by this appeal they made it a central feature of their Christmas message to consumers. A copy of the panel carrying this message is in every Wales Gas Board showroom.

Too much modesty

THE Building Exhibition is gone but not, it seems, forgotten, as comments are still reaching us, not a few of them praising the Gas Council on its ususual stand. But inevitably, mingled with the plaudits are criticisms, and we have been sifting both types of comments to see what emerges.

Congratulations rather belatedly, then, to the Gas Council for achieving working exhibits at vertical stage levels. They can exploit this idea more fully on a future occasion, in such a way that it does not give that faint and distasteful suggestion of being the remains of an air raid. Their SE-Duct seemed to be suffering from constructional expediency. Surely it is not solid, or at most one eighth of an inch wide? Yet it gave that impression. And will the Council please take a broad view of its responsibilities and see that the most modern fuel supplies hot water to a basin fitted with the most modern taps? A pair of 'skull and crossbones' crutch taps of late Victorian design well in view is apt to encourage our tap makers to prolong their indifference to design standards.

'Gas' is an elementary word. It could be a banner headline over a group of stands. But when we see a rectangular box about 4 ft. high, beautifully styled and finished in stove

enamel, it is confusing. Can this be a washing machine, refrigerator, gas cooker with lid, gas boiler, oil-fired boiler, solid fuel boiler, kitchen television set—those are a few of the possibilities. Unhappily it seems to be, usually, an oil-fired boiler, and frustration sets in.

If the manufacturers find it expedient to keep a foot in both camps, then the gas industry should persuade them to share in a special stand, grouping all those items which are specifically for gas. And please let the public know. Three letters—G A S. Something to be proud of, something worth shouting about. Don't miss the special GAS section!

In a world of superlatives the best is not remarkable. The Gas Council stand was good—very good—but without massive flank support from the gas industry (not the gas, etc., industry) it might as well have been Joe Bloggs. Next time, let the gas industry take a row to itself, and if the rest of the world calls it Gas Alley that will be real progress.

It was a pleasure to see and recognise some convector fires. If we had been unable to get near them for a crowd goggling at the revolutionary 75% efficiency that pleasure would have been trebled. But it was all too modest, too unremarkable. Only the initiated could have known that something akin to a revolution in single point heating had been achieved.

There is a moral here, with two years in which to think it over, and, let us hope, more items in the running for real five-star treatment.

A meter revolution

THE paper entitled 'Forces in Meters,' presented to the Autumn Research Meeting by Mr. C. P. Henshilwood and Mr. A. E. Sharman, offers an exhaustive guide to the factors impairing the efficient running of gas meters today. It forms an interesting background to the news of Parkinson Cowan's introduction to the domestic market of a meter employing dry lubrication.

It is of course a fact that many of the failures on existing types of domestic meters relate to excessive wear and corrosion of bearings. These are caused by sticky valves and corrosion either because of the metals from which the bearings are made, or from the gas attacking the bearing grease. Grease reacts differently under varying conditions causing such troubles as changes in viscosity, oscillation and depositions on bearings, creating friction and wear. All these affect accuracy of registration, create a need for maintenance and reduce the life of the meter.

Ten years ago the Parkinson Cowan Company introduced dry lubrication on their industrial meters. One could hardly ask for a longer period during which the system could be assessed in the light of working conditions, and the success of the method is now unquestionable. This long period has therefore enabled the company to employ the same principles in the manufacture of domestic meters with complete confidence, and the model described in our Technical Developments feature this week is the result.

Other than in the diaphragms there is no grease in dry lubricated meters—even stuffing boxes are provided with synthetic rubber seals. Stuffing box glands are moulded in Ralsin, a special tough form of nylon impregnated with graphite. The nylon provides resistance to wear—the graphite provides lubrication. Tests on these bearings under extreme conditions on unpurified gas have shown the material to be virtually unaffected. A glance at the comparative photographs of crankshafts illustrated in the fold-out advertisement in last week's 'GAS JOURNAL' makes the point in dramatic fashion.

BRIEFLY . . .

Future of Ulster gas industry

The Northern Ireland Gas Employers' Board has decided to prepare a report on the gas industry in Northern Ireland, with the intention of ultimately engaging the services of an eminent gas engineer to review Northern Ireland's problems and to advise on what changes may be necessary in the structure of the industry, if the price of gas is to remain cheap enough to be competitive. We understand that the Bangor Gas Manager, Mr. J. A. Derbyshire, who attended the recent meeting of the Board along with the Bangor Chairman, Councillor D. Ewart, reported to the Gas Committee that to finance the survey it was proposed to levy an additional subscription of 1s. 4d. per mill. cu.ft. of gas sold in the current year and for the year 1962-63. The recommendation was approved. Meanwhile the Alliance and Dublin Consumers' Gas Company announces that as from January 1 next, the price of gas will be increased by 1d. per therm.

Natural gas pipeline

According to *The Financial Times*, Mr. Arthur Whitehead, well known in the 'fifties as the man who wooed small investors with low-priced shares issued by his Whitehead Industrial Trust, is coming back into the public eye. He is helping an American name-sake (Edward D. F. Whitehead) to find the money to revive an old scheme—that put forward a decade ago (by Bechtel International) for piping natural gas from the Middle East to Europe. 'Observer' reports that the project should be under way in a year's time and finished by 1970. 'On the vital question of money—a $74 mill. question, on his estimate—Whitehead was generally secretive.'

Power of the pipes

Although a teenager, Denis Whitty, a clerk at the Scottish Gas Board's Dawsholm works, is making a name for himself in piping circles in Glasgow. A member of the famous Grade One Clan Macrae Society Pipe Band, he won the Cameron Challenge Trophy for solo marches in a recent competition held by the Scottish Piper's Association in the New Highlanders' Institute, Glasgow. Our report states that at functions organised by the Board's Glasgow District Welfare Club, Mr. Whitty is a regular performer, but no mention is made of any measures taken to look after the welfare of any members who may *not* consider the bagpipes a friend of man!

Buddy, can you spare a dime?

Elsewhere on this page we refer to gas meter developments, but the major meter problem facing the industry at this moment is less one of development than modification. General reaction to the suggestion that decimal coinage be introduced in Britain is favourable, but the adoption of the system would be an extremely costly business for such as the gas industry, which would be faced with the task of altering 7,563,000 pre-payment meters. However, few are likely to mourn the passing of that classic phrase 'a shilling for the gas'!

From a paper to the Autumn Research Meeting of the I.G.E., London, November 21.

PVC pipes for town gas

By W. F. GARDNER, B.Sc., F.R.I.C.,
SENIOR CHEMIST,
and
I. KALUSHNER,
CHEMIST, CENTRAL LABORATORIES,
SOUTH EASTERN GAS BOARD.

NEW materials require careful assessment before they are adopted, and this is specially the case where hazards could arise through failure.

This applies very much to the replacement of conventional materials by plastics, and particularly to the change from steel to plastic as the material for the making of gas service pipes. The conventional ferrous-metal pipe has the great disadvantage of being susceptible to wastage and perforation by corrosion when buried in the ground. Plastic pipe would be quite unaffected by these destructive influences, but it has one potential weakness not shared by a metal pipe, and that is the serious loss of strength that may occur through softening by the hydrocarbon vapours in town gas.

A comparison of the properties of the various types of plastic pipe available suggested that adequate resistance to softening and reasonably low cost do not usually go together, and the most resistant are usually too expensive to be seriously considered for service pipes.

Some commercial brands of pipe are compounded with substantial proportions of materials, e.g., rubber, which are very susceptible to softening by hydrocarbons. It was clearly necessary to avoid formulations of this kind. It appeared, therefore, that only the so-called unplasticised, or rigid, polyvinylchoride was likely to provide an acceptable balance of properties, though even this must contain stabiliser and lubricant; also, the inclusion of pigments may be specified. The total additives, however, should be kept to the absolute minimum.

The type used

The particular polyvinylchloride used in the investigations was a homopolymer containing approximately five parts of such additives per 100, with a Fikentscher *K* value as measured in solution in ethylene dichloride of 65.

Tests involving exposure of specimens to vapour were considered as being much more realistic than their immersion in the liquid hydrocarbon, and a series of tests of this kind was made. The hydrocarbons used were those present in significant concentrations in town gas, but, for completeness, carbon disulphide was included. Each weighed specimen of unplasticised polyvinylchloride (5.2 by 2.6 by .3 cm.) was suspended above the liquid hydrocarbon in a closed bottle, and some three dozen bottles were stored in a temperature-controlled box, supported on a rocking platform. The specimens were weighed at suitable intervals, and the increase gave the amount absorbed.

Provided the plastic showed a strong affinity for the vapour, the weight increased rapidly at the start. With increasing time of exposure the rate declined until eventually an equilibrium appeared to be attained. The rate of absorption was highest, and equilibrium was reached most rapidly, for hydrocarbons with the highest vapour pressures. Benzene required about 14 days, toluene took 20 days and *o*-xylene took about 110 days. The final equilibrium values, however, are of the same order for all three, i.e., between 46 and 54% absorption.

Dangerous hydrocarbons

A comparison of the experimental results shows that the dangerous hydrocarbons are the lower members of the aromatic series (benzene, toluene, ethylbenzene and the xylenes) and aromatics with unsaturated side chains (styrene and indene). Aromatic hydrocarbons containing more than two methyl groups, or with longer aliphatic side chains, would appear to be of low activity. The saturated paraffins and *cyclo*paraffins are inert, but slight activity seems to exist where there is a double bond, e.g., *cyclo*hexene.

These experiments were carried out at 23° C., since this temperature represents about the maximum likely to be reached by a service pipe, and it is a convenient temperature to maintain experimentally. However, the absorption process is likely to be influenced by temperature, so a shortened series of tests were made at 0° C ±1°.

To explore the region of partial saturation so as to define the relationship between absorption and degree of saturation, and so equate results to the actual effect of town gas, a similar technique was used, but the atmosphere around the specimen was maintained at a calculated degree of partial saturation by using a mixture with the appropriate amount of a non-volatile diluent.

A point of great practical importance revealed by the experiments was that the amount of hydrocarbon taken up at equilibrium declines sharply as the concentration of the vapour to which the plastic is exposed falls below saturation.

A recent investigation on the absorption of hydrocarbon vapours by rubbers used in pipe connections (jointing rings), gave absorption curves very similar to those now obtained for polyvinylchloride.[2]

The conclusions drawn from experiments at 23°C. did not necessarily hold at other temperatures, but it was impossible to indicate, from theoretical considerations, whether a lower temperature would enhance or repress

absorption. Accordingly, experiments were repeated at 0°C.

The absorption at 0°C. was very slow compared with the rate at 23°C., but true equilibrium did seem to be reached; there was no suggestion of a slow creep in absorption that might have an appreciable effect over a very long period of time. Evidently, temperature has a powerful influence on the absorption process. A buried service pipe is unlikely to remain for any considerable time near either of the temperatures employed in the experiments; it is, in fact, likely to operate in the range 7° to 15°C. Actual conditions of service may be expected to be considerably more favourable towards durability of polyvinylchloride pipe than the experimental condition of 23°C.

Measurements of tensile strength were made on a series of specimens which had been exposed to a variety of hydrocarbon vapours, saturated or at a known level of partial saturation at 23°C. Several typical aliphatic hydrocarbons were included, and used at full saturation.

Properties failure

There is no question that complete failure of mechanical properties would result from a high degree of absorption of the aggressive types of aromatic hydrocarbon; for example, a rubber-modified polyvinylchloride, on exposure to benzene vapour at .89 saturation for 24 days, showed a 23.4% gain in weight, and the tensile strength fell to 22% of its original value.

The tensile test figures indicate that conditions giving absorptions exceeding about 2% should be regarded with suspicion.

The foregoing tests serve to show that the only hydrocarbons that need be considered very aggressive are broadly, the C_6, C_7 and C_8 aromatics, especially where side chains with unsaturated bonds are present. In concentrations near saturation, their presence would result in failure of polyvinylchloride at temperatures around 20°C. At lower concentrations, below 60 or 70% of saturation, their activity diminishes to almost zero.

A few types of gas even approximate to containing one type of vapour, but, in general, most town gas will contain a mixture of vapours, probably six or more components, and an examination of the behaviour of polyvinylchloride towards mixtures was clearly indicated.

The results of numerous experiments with two-component mixtures showed that (a) mixtures of saturated aliphatic hydrocarbons are virtually inert towards unplastised polyvinylchloride, (b) mixtures of the aromatic hydrocarbons behave additively, and (c) certain mixtures of aromatic and aliphatic hydrocarbons tend to show considerably higher aggressiveness than would be anticipated from the behaviour of the separate components in single-hydrocarbon experiments.

The three component mixtures show similar effects to those with two components. Aromatics seem to act additively as a type of hydrocarbon, and the uptake by the plastic rapidly decreases to zero as the aggregate concentration is reduced.

For the mixtures of gases from carbonisation and gasification processes, as distributed in this country, the problem of assessing the effect on unplasticised polyvinylchloride involves extension of the findings for one, two and three component mixtures to at least six components.

According to the experimental results, the decisive factors are hydrocarbon type and fractional saturation. The aromatic hydrocarbons, benzene, toluene, xylenes, ethylbenzene, styrene and indene should be considered as a group. When styrene and/or indene constitute a substantial proportion of the group, some allowance must be made for an enhanced aggressiveness imparted to mixtures by their presence.

The meaning of 'fractional saturation' for a group is difficult to specify exactly. For each hydrocarbon percentage in the analysis, a volume is then calculated in which the hydrocarbon would be saturated at some selected temperature. By adding together these saturated volumes for the aromatic hydrocarbons, and dividing by 100, the fractional saturation for the aggregate aromatics is obtained.[1, 4] The value thus calculated will depend on the temperature assumed for calculation, increasing with decrease of the temperature selected. However, earlier experiments showed that, at low temperatures, the action on unplasticised polyvinylchloride is at a minimum, even with saturated vapours.

Values obtained by the above method should be compared with the data relating aggressiveness and fractional saturation. If the calculated fractional saturation with aromatics does not exceed .5, attack on unplasticised polyvinylchloride is unlikely to occur. Above .5, attack becomes possible, especially if unsaturated hydrocarbons such as styrene are present, as these have an accelerating effect. However, there is normally a useful margin of safety even beyond .5 saturation. Paraffin hydrocarbons are, by themselves, inactive, but in mixtures with aromatics, there is a possibility of the synergistic effect, and, if present in amount comparable with the aromatics, they cannot be ignored.

A condensate deposited by supersaturation of the gas with hydrocarbons would be dangerous enough to prohibit the use of polyvinylchloride pipes. If there is any evidence that this may be occurring, it would be advisable to examine the condensable hydrocarbon content of the gas and make an estimate of the degree of saturation as already indicated.

A rather different problem in condensate deposition may arise when gas is compressed, to any considerable pressure, for transmission. The decrease in volume of the gas will give a proportionate increase in the partial pressure of each hydrocarbon vapour present. If, as a result of compression, the partial pressure of any one hydrocarbon is raised above saturation pressure at earth temperature, the deposition will occur in transmission.

Practical trials

Parallel with the foregoing laboratory investigation, fairly large-scale practical trials have been instituted by the Chief Distribution Engineer of the South Eastern Gas Board in the London Suburban area. The pipe used conformed to the suggested specification for hydrocarbon resistance. The gas was a mixture of coal gas which had been oil-washed to recover benzole, and carburetted water gas from light feedstock. The gas yielded a cryoscopic condensate amounting to .81 ml. per cu.ft.

The condensate was analysed for main constituents by gas/liquid chromatography, and the volume percentage on the gas, and the saturated volume occupied by each constituent, per 100 volumes of gas, were calculated.

The absorption practically disappeared at three-quarters saturation, whereas the gas was not a quarter saturated. Therefore, a wide margin of safety existed in using the tube for this gas. Sections of tube were recovered from service after 12 months' use, having passed an average of about 20,000 cu.ft. of gas. There was no detectable change in the properties of the material.

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DISCUSSION

Mr. F. L. Atkin, Chief Distributing Engineer, West Midlands Board, said that the distributing engineer had to think in terms of 40 or more years as a useful life for an underground pipe. This was owing to the high cost of taking up and relaying pipes, especially gas service pipes, which was the principal concern of the present investigation.

In laying a new service, the cost of the materials was not more than one-third of the total laying cost, so that small differences in the cost of the pipe were not significant compared with the ultimate cost of laying.

There was no doubt that the use of a plastic pipe as a gas service pipe was most attractive. It was light in weight, not easily damaged in storage or in use, and it would be resistant to external corrosion except in one or two very special environments, such as a sub-soil saturated with hydrocarbon oils.

The authors had suggested that rigid PVC materials would behave more satisfactorily in certain circumstances, *i.e.*, when the gas had been compressed, or in areas supplying gas containing a minimum of harmful constituents. An area receiving gas from a traditional coal carbonisation plant today might have gas made from oil tomorrow and reformed natural gas the day after.

The authors had shown the effects of the different harmful constituents, but he asked whether they would feel quite confident in using rigid PVC for all types of gases, which might be in use now or in the future.

PVC materials were visco-elastic, *i.e.*, the physical properties altered with time. Apart from the effect of hydrocarbon absorption, the tensile strength decreased rapidly in a comparatively short time, and could decrease by three or four times in the course of months, but thereafter much more slowly—on a decreasing logarithmic increment. There were a number of effects of this phenomenon: First the pipe had to be sufficiently thick to maintain its circular form when subject to the over-burden of the sub-soil not only when new but when its strength had deteriorated over the years. Secondly, a connection had to be made to metal at both ends, but both compression joints and screwed joints relied on elasticity, *i.e.*, the power to resist deformation. These types of joints were unsatisfactory, and the only suitable type would appear to be the rubber ring joints as used on flexible fittings. Only time would show whether there was any deleterious effect of the rubber and plastic joint.

Though a traditional steel service pipe internally coated with red lead and adequately protected would have a life of at least 50 years, most distributing engineers would willingly change to plastic pipes, if it were possible to rely on a similar potential life and comparable costs.

Mr. T. W. Jackson, Area Distribution Engineer, South Western Board, said that an important criterion in the assessment of non-metallic materials had been their ability to prevent diffusion of gas constituents. Their own laboratories had initially carried out a series of tests on nylon tube including, (*a*) the change in gas pressure against time of a fixed volume of gas, (*b*) the change in volume against time of a gas maintained at atmospheric pressure, (*c*) the change in composition of a gas after a period of confinement, and (*d*) the change in volume against time of a commercial hydrogen and a hydrogen-nitrogen mixture.

Diffusion had taken place in each case and had been substantiated by gas analyses before and after confinement. The greatest change had been in the concentration of hydrogen.

The investigation had then been further extended to evaluate (*a*) unplasticised polyvinylchloride, (*b*) phenol-formaldehyde co-polymer with a fabric base and (*c*) unplasticised polythene.

With the tests of diffusibility carried out under constant volume and constant pressure conditions—at 60° F. and 30 in. Hg—the results had indicated that all materials had exhibited porosity to a varying degree; one sufficiently to eliminate the material from further consideration.

If an appliance connected by plastic tube was to be isolated for any period from the main supply by shutting off the main cock, vacuum conditions might arise in the tube, thereby presenting a potential risk if an attempt was made to light the appliance before the tube was thoroughly purged with gas. This would, of course, depend upon the rapidity with which a light was applied to the burners.

Mr. P. D. Allan, Managing Director, Chemidus Plastics Ltd., said that the plastics industry believed that the gas industry alone was capable of assessing the extent of the chemical problem involved in the use of PVC for gas distribution. If the present paper provided gas engineers with a method of evaluating whether or not a particular gas formulation could be distributed through PVC pipes; it might well become a document of international significance.

The cost of a PVC pipe was directly proportional to its weight, and its weight in any given diameter rapidly increased with an increase in pressure rating. Therefore, the low pressures normally used for gas distribution would permit Class A pipes, *i.e.*, those pipes stressed to withstand 150 ft. head, to be used for all diameters. PVC Class A pipe up to and including 4 in. in diameter was the cheapest pressure piping available in this country today. In addition, its light weight and ease of jointing, allowed great economies to be made in handling, distribution, and installation. During the last three years, as a result of the greatly increased world demand for PVC polymers, the price had been reduced by 25%.

The techniques of laying, jointing and the connecting of services was now established and certain manufacturers could now supply consistently high quality pipes, but two years ago very few fittings had been available for use with PVC pipe systems because of the considerable technical difficulty in their production. However, fittings in unplasticised PVC up to 6 in. diameter were now available, and special fittings could be manufactured from the same material as the pipe for the gas industry as soon as the demand justified it.

Mr. T. W. Gibson, Chief Distribution Engineer, South Eastern Board, recalling the authors' reference to sections of plastic pipes which had been recovered after 12 months' service in the ground, said that he had examined pieces of

plastic pipe which had been in his board's area for six years, and so far they showed no detectable change, although the quality of the material from which they had been formed had not been quite to present day standards.

In 1959 his Board had authorised the purchase of a large quantity of 1-in. unplasticised PVC pipe, together with some lengths of 2-in., 3-in., and 4-in. pipe, in order to obtain experience in the field with this material. This field test had certainly given him practical experience in its use, though he would not recommend that the pipe in its present form should be laid in soils containing rock or a large percentage of sharp stones, or where there was any doubt of a first class bed being realised.

PVC was not as rigid as steel, and although care had to be taken with any bed on which pipe was laid, greater care must be taken with a plastic pipe. Filling in must also be carried out carefully, covering the pipe with 6 in. soil, sifted where necessary, and carefully punned before the final filling of the excavated soil.

Using a service-extracting machine when relaying services, it was a simple matter to push a plastic pipe back through the hole left by the extracted service, so when a relay was done in this way, considerable savings were made in material, labour and reinstatement costs.

Experience with the 2-in., 3-in., and 4-in. PVC pipes, laid in a number of suitable places, had shown that considerable savings were possible, particularly since his Board did not lay cast iron mains below 4 in. in diameter.

Once pipes had been buried in the ground he had not experienced any damage caused by low temperatures, although care had to be taken when handling pipes above ground in very cold weather. They should not be subjected to such unfair treatment as being thrown down on rough and uneven ground, and even if some buried pipes had been damaged by someone else, it could be argued that this was the lesser evil than damage to the protective coating of a steel pipe, leaving it a potential source of corrosion.

Although it was unlikely that there would be a quick change from the protected steel pipe, should a PVC pipe be given greater mechanical strength, there would be more enthusiasm shown in its use.

Dr. P. A. Small, Research Department, I.C.I. Ltd., Plastics Division, referring to the factors affecting the miscibility of liquids with PVC and their diffusion rates through it and its interest to them in I.C.I. for many years, said that as a result of their studies a general picture had emerged.

The equilibrium uptake of a liquid by PVC appeared to depend mainly on (*a*) the solubility parameter of the liquid and (*b*) the power of the liquid to act as a proton-accepter in hydrogen bond formation. Unfortunately little was known quantitatively about the hydrogen-bonding power of liquids, but qualitative comparisons could be made.

The nearer a liquid was in solubility parameter to PVC —for which the value was about 9.7—and the more its proton-attracting power, the more miscible with PVC it was expected to be. Aromatic hydrocarbons had a significant though rather weak power to form hydrogen bonds, increasing with degree of methylation. Neither saturated hydrocarbons nor carbon disulphide could do this.

Studies on diffusion of small molecules through polymers showed that large molecules diffused more slowly. Thus, in polythene, the ratio of the diffusion coefficient to the molecular cross-sectional area decreased exponentially with increasing molecular diameter. Further, the diffusion coefficient depended on composition—for vinyl chloride monomer in PVC, it increased by a factor of 1.6 for each 1% of monomer present. This kind of dependence of diffusion coefficient on concentration might be responsible for the S-shaped curves of [Fig. 1]. Since apparent equilibrium had been reached as fast or faster in the case of the liquids showing anomalously low absorptions, though they would have been expected to diffuse more slowly because of their larger molar volumes, it seemed reasonable to suppose that true equilibrium might not have been reached in these cases.

Further, the equilibrium uptake at saturation would not have been expected to change very much between 23° C. and 0° C., but as diffusion was an activated process, it would be much slower at 0° C.

Activation energies of perhaps 20 kCal. per mole or even more would have been expected for such large molecules, so that times for attainment of equilibrium at 0° C. should have been more than ten times as long as at 23° C.

Comparing [Tables 1 and 3], in most cases an apparent equilibrium had been reached more rapidly at 0° C. than at 23° C., so it seemed unlikely that the values at 0° C. represented true equilibria.

The results at fractional saturations less than unity, given in [Table 2 and Fig. 2], fell off more rapidly with fractional saturation than would have been expected theoretically, but according to the equations used to express the activity of a liquid over a polymer-liquid mixture it might be estimated from an equilibrium uptake of 46.7% at 100% saturation for benzene, that the uptake would have been about 13.5% at 75% saturation and 7% at 50% saturation. The values of [Table 2] were considerably lower than these values, which was probably to be attributed to lower diffusion rates at lower uptakes and incomplete attainment of equilibrium in the time allowed.

Mr. K. Goodier, Technical Officer/Plastics, Plastics Laboratory, Shell Chemical Co. Ltd., complimented the authors on their very rational and practical, at the same time good academic, approach to a very interesting problem.

He said that if the resistance data for the various constituents in the town gas were examined, PVC appeared to have a wide margin of safety provided the upper concentrations indicated were not continuously exceeded.

There are several points of commercial interest, namely that 12% of all the water and gas service pipes in Holland were in fact now PVC, and that 22,000 miles of PVC pipe had been laid in Japan, of which an estimated 1,000 miles carried gas.

Between 1957 and 1961 in Italy, the use of PVC pipe had risen from 6,000 tons to 13,000 tons, but for Japan this could be multiplied by five. This material was in fact being increasingly used in other countries and the same pattern would be followed in this country.

Referring to previous speakers, he said that Mr. Atkin had correctly stated that the use of PVC for town gas could not be assessed and that accelerated tests were too severe, but the method used by the authors had given a true picture, though their results had tended to be a little too conservative. The material was indeed visco-elastic, but the tensile properties as such changed but little.

Incorporating fibre glass within the PVC pipe during extrusion did impart some very useful characteristics to the pipe, but in practice the reverse would occur, such inclusion of such material would completely upset the flow pattern during extrusion, and the PVC pipe would be of inferior tensile strength.

To confirm the faith the manufacturers of the base material had in their own materials, he quoted certain uses of PVC pipe: 30% Hydrochloric acid for six years; 98% sulphuric acid for six years; H_2SO_4/H_2SO_3 drains for four

years; 20% sodium hydroxide for six years; water for seven years and others of equal severity.

Mr. F. T. Buist, South Eastern Board, Sydenham, pointed out that although much thought has been given to the production of a cheaper therm into the gasholder, far less had been done towards reducing the cost at the consumer's control cock. The clearing and renewing of service pipes was one item of this cost which had drawn attention to a possible alternative to the present use of steel, wrapped outside, painted inside, and sometimes cathodically protected as well.

A material was wanted which did not need protecting, did not corrode, would stay clear in the bore, would have a low cost initially, and required little, if any, maintenance.

PVC appeared to offer all this. Eight years ago the authors submitted a similar report on the effect of aeromatics, *i.e.*, that a gas with a low concentration of these hydrocarbons caused no softening of the pipe. Should a temporary softening have taken place, the strength returned when the cause was removed.

After a year or more the earth surrounding a small diameter pipe became compacted into an arch, which would stay intact even if the pipe were removed, so unless gas at high pressure was to be contained, strength in the pipe wall was secondary, but rather the ability of the softened pipe to remain gas-tight was the more important.

Experience over the last six years in the laying of PVC services, had shown that they had passed from the laboratory to the pilot plant stage. Even so, they were well behind the Netherlands.

Since many new ideas were being applied to gas production, he wished to hear from appliance experts whether the N.E.A.T. burners, now so widely used, would be seriously affected by aeromatic concentrations of an order likely to affect a pipe of the specified quality. In this connection too the importation and future use of methane should be of assistance.

Mr. B. H. Holland, Chief Chemist (Scientific), North Western Board, said that waiting for test samples to reach equilibrium was often tedious but when the pipes might be carrying gas for 20 or 30 years the slow absorption of some component was, indeed, very significant. In the North Western Board a variety of PVC tubes had been examined over a period of three years on three different gas streams, and in general similar conclusions had been reached in that a limited number of aromatic compounds were responsible for the softening of PVC tubes and that paraffins and olefines had very little effect. Their own results might be a useful supplement to the present paper.

The argument that laboratory results were not necessarily related to practice had often been levelled at projects of this type, so they had set out to remove sample lengths of PVC tube from field trials for examination. The samples had been sealed and taken to the laboratory; the hydrocarbons had been extracted, and infra-red and chromatographic methods of analysis had been used to identify the extracts. The gases concerned were (*a*) one stream from horizontal retorts, (*b*) one from continuous vertical retorts, and (*c*) one from c.v.r. after partial benzole removal. Analyses of the benzole fractions removed by cooling these gases to $-80°$ C. had also been carried out.

In the initial tests with a rubber modified PVC it had been found that the sample exposed to c.v.r. gas became very soft and flexible and a linear expansion of 5-6% occurred. The hydrocarbons absorbed had consisted entirely of C_8, C_9 and C_{10} aromatics. The sample exposed to horizontal retort gas had been affected to a smaller extent although the benzene and naphthalene content of this gas had been greater than in the c.v.r. gas. The partially debenzolised gas had had no deleterious effect upon the tube. The benzole wash had removed only 20% of the benzene in the gas stream and 75% of the higher aromatics, but this gas had had no effect upon the PVC tube because none of the components had approached saturation.

More recent work with unplasticised PVC, after 18 months' operation, showed that it was far superior to rubber modified materials. Analysis indicated that of the hydrocarbons absorbed or deposited from the gas stream, 75% had been naphthalene with small amounts of C_8, C_9 and C_{10} aromatics from the horizontal and c.v.r. gases, while no extract had been obtained from the oil-washed gas.

While they were satisfied that in their 18 months' service these PVC pipes had suffered very little from the passage of coal gas, in terms of chemical absorption the material was more brittle than the rubber modified product, and about half the samples of tube examined had contained hair cracks around the circumference of the tube. While tensile strengths about 7,000 p.s.i. could still be obtained from the tube after service, test pieces had been chosen to avoid these cracks. Further investigation of this condition was to be made.

To return to more detailed points in this paper he found the discussion of fractional saturation difficult to follow, and the calculation of results at 15° C. hardly significant when the fractional saturation was greatest at low temperature. The results presented in [Table 3] showed that the rate of absorption of hydrocarbons was greater at the higher temperatures, but the final equilibrium at 0° C. and 23° C. should have been similar and the low absorption at 0° C. indicated that it took much longer to reach the equilibrium state than the period of testing given by the authors.

It was not difficult to obtain condensation of hydrocarbons from town gas by cooling to 0° C., and occasionally condensation did occur in gas distribution pipes. The analysis of such condensates showed about 10% high boiling paraffins and 90% aromatics. A typical analysis was: 2% Benzene; 4% toluene; 32% C_8, principally xylene and styrene; 42% C_9, 10% C_{10}, including naphthalene.

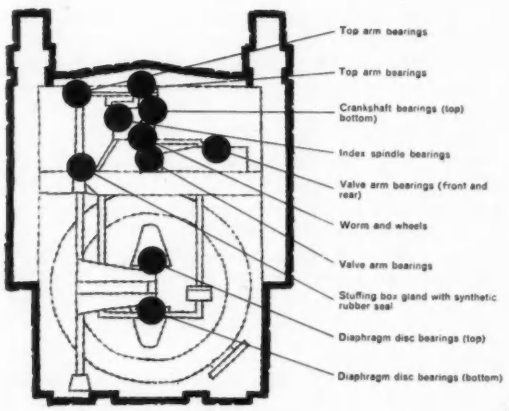
Their experience did not support the view that benzene and toluene had any significant effect upon PVC tubes at the normal temperature and pressure of distribution. So far as these components were concerned saturation occurred at about $-20°$ C., and they were present in the tubes and liquid condensate in equilibrium with the benzene and toluene content of the gas only to the extent of their solubility in other condensed hydrocarbons.

Certainly the graphs in [Fig. 2] and values in [Table 2] indicated that only when components were near to saturation or actually condensing, did the PVC absorb the hydrocarbon concerned. Their own results with partial benzole washing were a practical confirmation of these results.

While he did not agree that a chemical absorption test should have been adopted to test the strength of a PVC sample when it was possible to obtain values of tensile strengths directly, it could have been misleading to relate PVC absorption to the gaseous content of hydrocarbons when only the components near to saturation were significant. In [Section IX] it was suggested that benzene or possibly benzene with 10% styrene should be used, but his own opinion was that a more suitable mixture would have been styrene, xylene and indene, with 10% benzene, and he would be interested in the authors' views on this point.

Technical developments

Dry lubricated domestic gas meters



This diagram indicates where dry lubrication is incorporated on the new range of Parkinson Cowan Domestic gas meters.

AVAILABLE in 1962 at no extra cost will be a range of dry lubricated meters for domestic use. The new units, which are not subject to bearing wear or corrosion, have greater accuracy, longer life and reduced maintenance.

The incorporation of dry lubrication in domestic meters follows the introduction of dry lubricated industrial gas meters by Parkinson Cowan ten years ago. All metal-to-metal bearing surfaces have now been eliminated, and all bearings are now of moulded Ralsin. This is a polyamide material impregnated with graphite, which can be moulded to very close tolerances without losing its fine surface finish.

It is tough and resistant to fracture, while tests in extreme conditions show that it is unaffected by unpurified gas over long periods of time. Ralsin is therefore a most suitable material from which to make not only larger components such as gear wheels, but also the smaller bearings in the pivots of linkages.

Under certain operating conditions gas tends to break grease down into its original constituents. These are carried forward by the gas onto the valve surfaces, leading to sticky valves, which can cause serious inaccuracies of registration. The original bearing surfaces suffer from under-lubrication, and wear at a rapid rate, leading to noisy operation and greater inaccuracy.

Ralsin bearings remain completely silent in use, and, since they neither wear nor corrode, dry lubricated meters in which they are fitted cannot suffer from measurement inaccuracy caused by bearing troubles.

Grease-impregnated felt seals in the stuffing boxes are replaced by synthetic rubber seals, which ensure maximum security against leakage and very low friction between the seals and the spindles or shafts. All shafts are now constructed from stainless steel or are heavily chromium-plated.

A statement by the Board of Parkinson Cowan Gas Meters says: 'In offering dry lubricated units to the gas industry, we are convinced that we are making available a gas meter that has greater accuracy of registration under adverse conditions, has a longer life as it is not subject to bearing wear or corrosion, and needs reduced maintenance.

'Parkinson Cowan have, in fact, been making dry lubricated units for industrial purposes for ten years, and the experience gained during this time has been incorporated in the new domestic types. Not one industrial meter has yet failed as a result of bearing wear or corrosion.'—*Parkinson Cowan Gas Meters.*

Grit arrester

THE original design of Centriflovane (Mark I) was adopted widely by the gas industry for its c.w.g. smoke stacks because it fulfilled the need for a simple, trouble-free grit arrester of moderate bulk, pressure loss and cost. Gradually, the gas-making capacity of c.w.g. plants of all sizes was increased until gas velocities in the stacks rose. Concurrently, there arose a demand for higher efficiency of grit separation, but without additional pressure loss. The Mark II Centriflovane was designed to fulfill this demand, albeit at the expense of an increase in bulk and weight, which is usually accommodated by supporting the larger sizes independently by steel-work instead of by the smoke stack as hitherto.

The latest demand for still higher efficiency of separation could be met only at the expense of either greater bulk and weight or higher pressure loss. The Mark III has been evolved to meet this demand. Being a specialised form of cyclone, development of the Centriflovane has followed accepted cyclone principles. First, by an increase in height of the separating zone, Mark II, and then by an increase in the ratio of the diameter of separating zone to that of the outlet, Mark III.

Centriflovanes are centrifugal separators in which grit-laden gas passing upwardly through an annular space between inner cone and outer shell is guided at the top by a series of swirl vanes and a curved crown plate and caused to enter tangentially the separating zone simultaneously around the whole periphery, thus avoiding turbulence.

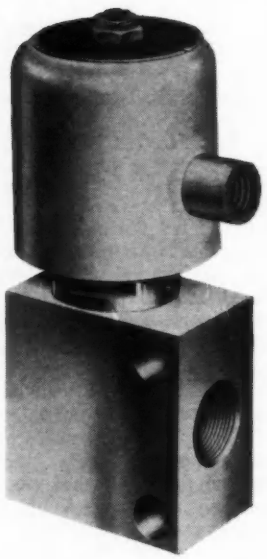
The guide vanes, in combination with the outer curve of the crown plate, turn the upward-flowing gases in a series of streams through 90° to join tangentially a swirling circle of gas just within the inner periphery of the circle of guide vanes, and from this level the gases pass downwards as in a normal cyclone to enter the inner periphery of a separating cylinder.

As the grit laden gases spiral downwards, the particles of grit are flung out of suspension by centrifugal force onto the surface of the inner cone and thence down to a suitable container connected by a pipe to the bottom of the inner cone.

Typical boiler stacks of c.w.g. plants having Mark I Centriflovanes and operating at a velocity of some 3,400 ft. per minute with gas at a temperature and density of 550° F. and .55 that of air at n.t.p. can be fitted with Mark II's without appreciable increase in pressure loss, but substan-

tial gain in efficiency. Mark III's have a w.g. pressure loss of 1.50 in. compared with the 1.05 in. of the Mark II in the typical conditions described above. This penalty for increased efficiency cannot always be accommodated without modification of existing conditions, and consultation with the manufacturers of the plant is recommended. Both Marks II and III are acceptable to the Chief Alkali Inspector's Department as meeting the 'best practicable means' requirement of the Alkali, etc., Works Regulation Act for c.w.g. plant.—*Tipton Tub & Tube Co., Ltd.*

New control valve



ANOTHER addition to the range of control valves produced by Ether Ltd., is now on the market. Type VPH has been developed for hydraulic and pneumatic servo duties. It is capable of operating in the pressure range of 250 to 3,000 p.s.i. and incorporates $\frac{1}{8}$-in. diameter orifice and $\frac{1}{4}$-in. B.S.P. connections. The valve is available in brass or stainless steel construction.—*Ether Ltd.*

Copolymer emulsion paint

A COPOLYMER emulsion paint is now being marketed under the name of Super Powerkote. This paint has the advantages to be obtained from the use of copolymer formulæ, *i.e.*, better adhesion, faster re-coatability, greater washability and scrub resistance.

The material can be used with equally effective results outside and inside. Super Powerkote can be used in bathrooms and kitchens on previously sealed surfaces such as gloss paints, in conditions of variable humidity.

A new pamphlet is available to trade users, and a comprehensive colour card based on the BS.2660 range of colours.—*Donald Macpherson & Co. Ltd.*

TRADE PUBLICATIONS

A new catalogue has been issued by 'Stanelco' entitled 'Electro-Gas'. This is a technique of flame-heating incorporating precision electrical control. The equipment operates on town gas which is mixed with compressed air, and then proportioned ready to be fed to special high-intensity burners. Air and gas flows are controlled by electro-magnetic valves and the heating cycle can be pre-set on a process timer. The catalogue describes various pieces of equipment and tabulates performance details. Examples of equipment in use are given.—*Standard Telephones and Cables Ltd.*

Information on the Ampco range of spark-resistant tools is given in the Technical Data Sheet No. 2. This Data Sheet includes extracts from an article published in the German safety journal Arbeitsschutz. In the Data Sheet is information concerning experiments on the dangers of explosion, and suggests several principles which should be observed in carrying out mechanical work in areas endangered by explosions.—*Optoshield Ltd.*

A number of leaflets has been issued by George Kent Ltd. There are specification sheets on level and pressure instruments, and low-head instruments, a publication on Universal miniature primary elements, and another giving standard ranges for Multelec Mark 2 temperature instruments. There is also a spare-parts list for the ST/L manometer, and a list of Kent after-sales service together with a map of the U.K. giving service areas.—*George Kent Ltd.*

Volume 1, No. 1 of 'Ion Exchange Progress', which is to be issued quarterly, was published recently. The first number was sent to 10,000 research workers and technologists and was distributed in the U.K. only. The second issue will be an overseas edition.—*Elga Products Ltd.*

An illustrated 4-page leaflet is now available, entitled 'High Pressure Industrial Gas Meters by Parkinson Cowan'. As well as describing and illustrating the construction of the B 1200 and B 2000 high pressure meters, the leaflet also provides performance curves, dimension diagrams and abridged specifications.—*Parkinson Cowan Gas Meters.*

'Glokem waxes' is the title of a recently-published booklet dealing with these wax-like materials which have been developed for many uses in industry for which natural waxes are not suitable. Features of these materials are described and some of their applications considered.—*Glovers (Chemicals) Ltd.*

'Audco Valves for Gas Distribution' is the title of a new catalogue which gives details of various types of valves, syphons, and services, and then describes specific Audco valves, operating equipment, and remote control. The catalogue is fully illustrated with photographs and diagrams.—*Audco Ltd.*

A new publication on 'Hardinge Thickeners' has been issued recently. These machines are designed to remove the maximum amount of liquid from a mixture of liquid and finely-divided solids.—*International Combustion Products Ltd.*

JAKOB WÜRTH, MANNHEIM CORRESPONDENT OF THE 'GAS JOURNAL,' REPORTS ON—

GAS IN GERMANY

The Ruhrgas A.G., a joint undertaking of the Ruhr Collieries improved its position in 1960. For the first time gas deliveries exceeded 5,000 mill. cu.m. Fifteen towns with their own yearly gas production of 85 mill. cu.m. were connected to the firm's long distance gas supply main, which is now 2,422 km. in length.

●

Recently the city of Bremen concluded a long term gas agreement with the Ruhrgas A.G., by which the town will close its own gas production plant with a yearly make of 70 mill. cu.m. by the year 1963.

●

The Ruhrgas A.G. will raise its investments in the coming year to 140 mill. DM. The firm declared, however, that it had no intention of becoming a monopoly, but would join with other long distance gas undertakings to form new operating companies. The management went on to state that the firm had now reached a turning point in gas production, since the proportion of the gas produced from mineral oils and natural gas was rising while that produced at the coke oven plants was declining.

●

Two thirds of the Western German natural gas output comes from Northwest Germany with its 15 natural gas fields. The yearly output is about 1,000 mill. cu.m. This output capacity could be raised to about 2,000 mill. cu.m. in two years' time. A survey of the district would need 30 borings to depths varying from 3-4,000 m. at a cost of 200 mill. DM.

●

At the School for Engineers at Cologne a new course for the theoretical training of pipe masters has been started, by which it is now possible for pipe-fitters to pass an examination to qualify as pipe masters in the gas and water industries.

●

Gas consumption by Western German industry in the first half year of 1961 was 9,190 mill. cu.m., of which the consumption of natural gas amounted to 155,000 mill. cu.m. The iron and steel industry had the highest consumption with 3,150 mill. cu.m. gas, and the chemical industry 750,000 mill. cu.m.

The city of Munich which has contracted for 650,000 cu.m. natural gas daily will supply the city of Augsburg by pipeline.

●

At Karlsruhe in South West Germany a plant is to be built for the production of refinery gas for long distance transmission. It will cost 12 mill. DM. and have a daily production of 750,000 cu.m.; gas detoxication plant will also be installed.

●

The Dorsten gas production plant of Ruhrgas A.G. situated northwest of Essen, has been nicknamed 'turn plate,' because from here gas produced from coal and natural gas enter the firm's long distance lines. In this plant the gas produced from coal by high pressure steam, independently of coke, is suitably enriched by natural gas brought by pipeline from Emsland. By a new method of conversion, the admixture of natural gas with that from coal by high steam pressure can be doubled. Thus consumers of gas from the long distance network may be able to buy increasing quantities of natural gas without the necessity of costly conversions. Some of the large consumers can be supplied directly with natural gas by a pipeline running from Emsland to Dorsten, where the gas is cleaned.

●

Many Western German town gas plants have lowered the price of gas for domestic consumers by as much as 25%. The tariff committee of the German Gas Plants Association has declared that it is quite possible that a price of 11 Pf. a cu.m. for domestic gas may be introduced in the near future.

●

At Munich the natural gas reforming plant with an existing daily capacity of 230,000 cu.m. was extended by installing a new catalyst conversion plant with an output of 350,000 cu.m. town gas daily so that it is now possible to produce 600,000 cu.m. of natural gas there daily. Conventional gas-making plants are, however, held in reserve.

●

The city of Hanover intends to convert its heating plant to firing by natural gas. The city has concluded a contract with a natural gas company at Grossburgwedel for the delivery of 300,000 cu.m. of natural gas in the next 15 years.

Gas Council calls meeting with landowners on plan for underground storage

THE Gas Council is going ahead with its plan to store gas underground in an area of about 3,500 acres in and around Chilcomb, near Winchester, Hampshire, writes *The Financial Times* Industrial Correspondent. In a statement the Council said it is promoting a Private Bill in Parliament to authorise this, with the consent of the Minister of Power. If the scheme is approved, the industry will store gas during the summer, when demand is low, for use during the peak demand periods in the winter.

About 10,000 mill. cu.ft. of gas could be put into the ground around Chilcomb. This compares with a capacity of about 5 mill. cu.ft. in the average gasholder, and is sufficient to supply the whole of Wales for nearly six months.

Gas Council experts have estimated that a total underground storage capacity of 60,000 million cu.ft. would be needed during the summer months to achieve the greatest economy of operations. On this basis the Council, while initially needing three or four underground 'gasholders' will eventually require six on the scale of that at Chilcomb.

THREE SITES

Prospecting has gone forward at three sites in the Midlands, in the Leamington area and near Stow-on-the-Wold. Another site in the North of England is being considered. An old salt mine on Teeside is being used by the Northern Gas Board to store gas.

At Chilcomb, no gas—other than that in the supply pipes—would be stored above a depth of about 500 ft. from the surface. Eighteen sites, each about 100 ft. by 125 ft., would be needed for boreholes. Once these had been drilled, only the well heads and certain small items of equipment would remain on the site. The Council has been advised that it would be possible to instal this apparatus underground, so that only the wellhead covers would be visible.

A MEETING

Each landowner in the area affected by the Bill has been informed of the Council's proposals and discussions have taken place with county and local authorities. Landowners and other interested parties have been invited to a further meeting on December 13.

Underground storage is extensively used in the United States, France, Germany, and Russia. It is claimed that underground storage would improve the prospects and attractions of a national gas grid, and that large-scale Lurgi production would benefit.

Underground storage would also be ideal for the methane gas which the Council intends to import from North Africa. It has been calculated that Chilcomb could take 18 shiploads of methane, in its gaseous form. On this point the Gas Council said it might be possible to use part of the Chilcomb area for storage of methane 'in due course'.

Minister contacts the Chairman

THE Government is continuing with its plans to strengthen the resistance of the nationalised industries to granting wage increases, says the Labour correspondent of *The Financial Times*, in a review of the 'pay pause.'

The Minister of Power, Mr. Richard Wood, he reports, has explained to the Chairman of the Gas Council, Sir Henry Jones, 'the need for the pay pause' and asked that the lead given by the Government in the sector under its own control should be followed in the gas industry.

No special date has yet been fixed for the Gas Council to give its reply to the pay claims for 120,000 manual workers.

The next regular meeting of the industry's joint industrial council is at the end of January.

The actual number affected by this pay claim is approximately 80,000.

NEWS SUPPLEMENT

Parkinson Cowan honours long service

AT a dinner in the Bavarian Suite, Belle Vue, Manchester, recently Mr. H. P. Barker, Chairman of Parkinson Cowan Ltd., presented long service awards to 128 members of the Parkinson Cowan Long Service Association (Northern branches).

Total membership of the association is now 157, and this includes 116 who have over 25 years' association with the group. The dinner was attended by members from factories at Stretford, Manchester, Great Harwood and Oldham, Lancs.

Senior member present was Mr. D. Boyle who started work with Parkinson Cowan 70 years ago, and has been retired for 16 years.

Mr. A. E. Clarke was presented with a badge to mark the completion of 50 years' service with the Group, and Mr. L. H. Rolfe, Assistant General Manager of Parkinson Cowan Gas Meters, was presented with a badge to mark his 40 years' service.

Other presentations included badges to six members who had each been with the Group for 25 years, and the introduction of ten new members who celebrated their 21st anniversary of joining the Group this year.

THE END OF THE LINE

The last of the North Thames Gas Board's Beckton Jumbo-class locomotives, No. 25, has been retired, having come to the end of its useful working life. 'Thames Gas,' the Board's magazine, says the locomotive has really reached retirement age, because it is 65 years old. No. 25 will enjoy an honourable retirement for the Board has presented it to the Industrial Locomotive Society, who are to preserve it in the museum of the Bluebell Line at Sheffield Park, Sussex. There the engine will be on exhibition.

Common Market: Gas 'of major importance' in fuel economy

THE importance of gas in the fuel economy of the European Common Market was mentioned by Mr. Sydney Smith, Chairman of the Scottish Gas Board, when he addressed Edinburgh City Business Club.

'We can already begin to see in the vast possibilities of European gas developments how gas will be of major importance in the fuel economy of the Common Market,' he said.

As far back as August 1958 a report published by the Organisation for European Economic Co-operation stated that gas would maintain its share of the total energy supply in Europe even in the face of severe competition from other fuels.

'DANGEROUS'

'And yet,' Mr. Smith declared, 'there are probably more people per head of population in this country than in any other who still think that gas is out of date. Such people, and there are some in influential quarters, think dangerously.

'It is they who are out of date. Without the proper use of gas this country cannot make the most economic use of our indigenous resources of energy.'

Mr. Smith said that the gas industry in Scotland had not yet made as spectacular advances as in some other countries, but in the past few years they could claim to have transformed the shape of the industry and were ready to play a much larger part in the fuel economy of the country than ever before.

NEW SOURCES

New sources of gas were being developed, including gas from the Lurgi plant at Westfield, coke oven gas from Lanarkshire, methane from collieries in Lanarkshire and Fife, and refinery gas from Grangemouth.

Mr. Smith said that gas would become cheaper from these new sources. 'But,' he added, 'since we live in an inflationary economy it does not mean that the present price of gas will necessarily be reduced. It certainly does mean, however, that in spite of inflation, we have every hope that the price of gas will remain stable.'

Strabane (Co. Tyrone) Urban Council recently decided to increase the price of gas from 12s. to 12s. 6d. per 1,000 cu.ft. The Town Clerk, Mr. J. Bradley, said his forecast was that if the gasworks were to be maintained they would have to have an increase every year. The Manager, Mr. J. Lusted, said arrears on hire purchase accounts had been reduced from £1,900 to £857.

VISIT TO GAS BOARD TRAINING CENTRE

Members of the Clean Air Society inspecting a West Midlands Gas Board clean air demonstration van. In the foreground is the Board Chairman, Mr. C. H. Leach.

THE West Midlands Gas Board were hosts to about 40 members of the West Midlands Division of the National Society for Clean Air and were able to show them at first hand the part that the gas industry is playing in the drive to banish smoke and smog from the atmosphere.

The first speaker at the morning session was Mr. D. E. Mackenzie, Technical Assistant to the Commercial Manager, who was deputising for Mr. A. V. Horsfall. He described how the gas industry was well to the fore in providing new appliances to meet modern standards of comfort and cleanliness and he made particular reference to the installations which could be provided by local authorities in building blocks of flats.

Next came the Board's Coke Manager, Mr. D. N. Maddocks, who said that while not all coal merchants were to blame there were far too many who were apathetic to the use of smokeless fuels, apathetic to furthering the cause of clean air. They would 'hang on to coal to the last bitter embers'.

After a lively discussion members lunched at the Manor House Hotel, Leamington, where the guests included the Chairman of the West Midlands Gas Board, Mr. C. Harold Leach.

Councillor F. V. Magness, who presided, thanked the gas board for their hospitality and the opportunity of visiting the training centre.

In the afternoon, members returned to the Warwick Training Centre where they inspected coke and gas appliances and one of the Board's clean air demonstration vans.

Dame Alix Meynell, Chairman of the S.E. Gas Consultative Council, was one of the speakers at an open meeting organised by the Women's Gas Federation for representatives of 33 women's organisations. The audience were told some of the new developments now taking place in the gas industry. On the platform were: Mrs. L. W. Roberts, W.G.F. Chairman, Dame Alix Meynell, Sir Henry Jones, Chairman of the Gas Council, Lady Davidson, President, Women's Gas Federation, Mr. Christopher Chattaway, M.P. and Mrs. Joan Robbins, Home Service Adviser, the Gas Council.

Installations staff training

A part of the boiler section at the Southern Gas Board's central heating and warm air training centre. Left to right: Mr. G. E. Taylor, Senior Gas Fitting Instructor, Mr. A. F. Hetherington, Chairman of the Southern Gas Board, Mr. K. Checkley, Sales Manager, International Boilers & Radiators Ltd., Mr. D. L. Hill, Training and Education Officer.

A part of the SE-Duct installation (left centre).

The dummy floor 'battle section' in the centre. Left to right: Mr. G. E. Taylor, Mr. H. Hayward, Stewarts and Lloyds Ltd.

A section of the centre, showing the spacious modern lay-out (right).

A corner of the ducted air room (above).

—New SGB central heating and warm air centre

THE Southern Gas Board has opened a new central heating and warm air centre for the training of installations staff. Developed as an extension of the Board's training and education department at Bourne Valley, near Bournemouth, the centre will have a useful dual role in that it will provide a building centre for appropriate customers in the Dorset and Bournemouth Region, thus supplementing the Board's extremely valuable building centre at Winchester.

The first course consisted of Installations Superintendents and Quality Control Supervisors in line with the Board's policy of 'training from the top.' Subsequent courses will be held for supervisors, fitters, and possibly registered installers.

As far as is known, this centre is the first of its kind, containing as it does a complete range of equipment, all of which has been installed in such a way as to provide an infinite variety of practical exercises.

Mr. D. L. Hill, the Board's Training and Education Officer and an enthusiast for realistic training, has even installed a dummy ground-floor, complete with rubble, under which students will be expected to lay ducting.

In short, this is an extension of the principles applied at the Board's distribution training 'battleground' to cover complete training in the installation and maintenance of central heating and warm air equipment.

Many equipment and appliance manufacturers have helped to make this training centre the most complete and modern of its kind and Mr. Hill is warm in his appreciation of their co-operation.

SEGB AWARDS RECOGNISE EXEMPLARY CONDUCT

NINETEEN employees of the South Eastern Gas Board have been awarded Certificates of Commendation recording and recognising instances of exemplary conduct in the service of the Board, the public and fellow employees.

Apart from two who could not attend, they all received their awards from the Chairman, Mr. R. N. Bruce, at a reception at the Board's Croydon headquarters.

Mr. T. R. Holdstock, Assistant District Manager, Reigate District, receiving his award from the Chairman of the South Eastern Gas Board, Mr. R. N. Bruce, at Croydon, for action taken during severe flooding at Povey Cross and Charlwood, Surrey, in November, 1960.

Medway employees who received awards for exemplary conduct (l. to r.): G. W. C. Hurley, Gillingham; G. E. Monson, Rochester; A. G. J. Philpott, Rochester; and G. F. Kemmenoe, Rochester.

The illuminated certificate, in a polished black frame, was designed by Mr. D. W. Benney of Guildford, who was responsible for the rolls of honour in the R.A.F. Church of St. Clement Danes, London, and is a notably distinguished memento.

The awards are made for exemplary conduct and outstanding service which, for example, prevents injury, saves life or avoids a breakdown in the supply of gas.

It was two years ago that the Board announced that these certificates would be awarded and it was decided to investigate the period back to nationalisation and make awards to cover the whole period. This is the second group to receive awards and it is hoped that the list will be brought up-to-date very soon.

In offering the Board's sincere congratulations and good wishes, Mr. Bruce said:—

'It is not my intention to mention detailed individual citations, nor do I think you would wish me to do so, for it is my feeling that men of courage and resource such as yourselves are modest.

'There is no doubt that life was saved by five of you here today, and indeed in one case where two lives were involved the Royal Humane Society made an award.

'You give an example which we must all emulate in this organisation, where service to the public has always been our watchword and will, I know, continue to be so.'

Most of the awards this year were for action taken during the severe flooding at Sittingbourne and Rochester works in 1953 and at Maidstone and Lewes in November, 1960; for action taken at an escape of gas at Rochester Bridge in December, 1955; and for action taken to resuscitate people overcome by gas.

Natural gas

WORK has now started on the laying of mains to extend the natural gas supply from Whitby as far as Pickering and villages in the area.

Eventually it will be extended to Malton.

CORRESPONDENCE

Young or old?

Sir,

The scene is a Research Meeting of the Institution of Gas Engineers. The author has introduced his paper, perhaps at rather too great a length (for everyone has already read it) and the discussion has been opened by one of the older generation, very ably, but also with more words than are really necessary. The Chairman announces that he must restrict the contributors to three minutes each. There is nothing new about this. It happens at nearly every meeting. It shows no sign of changing.

The first four contributors all exceed their three minutes. One takes six, another five. They cannot be stopped, for they are distinguished members of the industry, and feelings would be hurt (not only their own, but those of the various bodies which employ them) if they were not allowed to say all that they had come prepared to say.

They read their contributions laboriously and not very distinctly. Sometimes they seem to be in some doubt as to what sentence is coming next. They are roundly applauded.

They are followed by three more of the older generation, who have the grace to keep within their allotted time. One of them is rather concerned to establish that what he said in 1937 was right after all.

Another refers to the 'policy of my Board,' which might be thought to be at variance with the views of the author. The third is quite clever in finding small errors in the paper.

And finally, at the tail-end, three young men. The Chairman looks at his watch and regrets that they have now only two minutes each. They speak very well. Each one has rehearsed what he intends to say, and is able to produce whole sentences without looking down at his notes. They speak from first-hand knowledge, for this is their own field.

They and the author are probably the only people present who have actually made measurements in the subject in the last twelve months.

It means a lot to a young man to speak at an Institution meeting. It means a lot to the Institution to have young men in the industry at all.

May I recall a meeting nearly 30 years ago, when the Chairman expressed his usual regrets at the small amount of time available, and then called upon Dr. Hartley to open the discussion.

And Dr. Hartley said: 'I have written some notes of what I intended to say, Mr. Chairman, and I will ask you to take them as read, so that these few minutes may be used by some of the younger members.' Where is that spirit today?

May I also recall a more recent meeting, when Miss Maywen Godby taught us all a lesson. She spoke perfectly clearly, and in a most interesting way, and she used no notes at all.

In Parliament, Ministers are not allowed to read their answers. The same should apply to those who are invited to speak at an I.G.E. meeting. And is it too much to ask that the young men should be asked to speak first, while we still have any?

Yours faithfully,

W. ERIC BENTON.
Technical Director,
Sidney Flavel & Co. Ltd.
Leamington Spa.

PERSONAL NOTES

MR. R. BROADBENT has joined the Board of the British Thermostat Co. Ltd., the Parent Company of the Teddington Group, as Executive Director. Mr. Broadbent has also been appointed Chairman of Teddington Autocontrols Ltd., Teddington Controls (Export) Ltd. and P. W. Baker & Sons Ltd., and has joined the Board of Teddington Aircraft Controls Ltd. MR. C. S. GARDNER, Manager Director of Teddington Aircraft Controls Ltd., and MR. R. H. SEWARD, Managing Director of Teddington Autocontrols Ltd., have also joined the Board of the Parent Company.

MR. LESLIE HARDERN, Public Relations Officer to the North Thames Gas Board, has been married at Caxton Hall, London, to LILLIAN SUTTON, the Honorary Organiser of the Society for Individual Freedom. The gas industry, advertising, public relations, gastronomy, art, literature, and invention were represented at the wedding reception.

COMING EVENTS

January 4.—EAST MIDLANDS G.C.C.: Nottingham Chamber of Commerce, Smithy Row, Nottingham. 11 a.m.

MR. J. W. KAYE, group engineer with the North Thames Gas Board, has retired after 41 years' service in the industry. Mr. Kaye began his career with the City of Bath Gas Department, where his father was works superintendent. Later he spent a period with the Wakefield undertaking before being appointed gas engineer and general manager of the Ascot District Gas and Electricity Company in 1929. Mr. Kaye was appointed group engineer with responsibility for Slough, Uxbridge and Ascot works, to which was subsequently added Mill Hill, shortly after Vesting.

MR. M. H. TAPPER has been appointed Labour Officer in the North Thames Gas Board's Western Division.

OBITUARY

MR. L. FLETCHER, Scottish area manager for Parkinson Cowan Appliances Ltd., died recently at the age of 53. He joined the Company in 1946, and was appointed junior representative to assist his father, who was area manager in Scotland. He succeeded to the post on his father's death in 1948.

MR. D. G. HAGGETT, manager of the Scarborough district showrooms for 31 years until his retirement in 1959, has died at the age of 67. Mr. Haggett came to Scarborough in 1928 from the former Bath Gas Co.

TRADE NOTES

THOMAS POTTERTON LTD., London, S.W.18, recently made a direct delivery from their factory at Warwick to their agents in Belgium, Abair S.A. Two massive Leyland trucks carrying some £3,500 worth of Diplomat gas-fired boilers for domestic central heating purposes, embarked on the Cerdic Ferry at Tilbury en route for Brussels via Antwerp. This was the first time that Thomas Potterton Ltd, have provided a cross-the-sea, door-to-door delivery using their own transport, and the mission took three days.

WHESSOE LTD. directors have declared an interim dividend of 5%, less tax, on the ordinary stock for the year ending March 31, 1962. The directors report that orders continue to be received ensuring a satisfactory volume of work, but that margins are still low and it is anticipated that the profits for the current financial year will be lower than those for the previous year.

WOODALL - DUCKHAM CONSTRUCTION CO. LTD. have declared an interim dividend of 5%, less tax, for the year ending December 31, 1961. This is the same dividend as last year but is payable on capital as increased in June, 1961.

PUBLISHERS' NOTICE

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Classified Advertisements : All small classified advertisements are charged at **4/-** per line (approx. **7** words)—minimum charge **12/-** A Box Number address occupies **2** lines, and a further **1/-** is charged toward cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's journal.

Displayed Advertisements : Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received **14** days prior to publication if proofs are required. Type area of inside pages **10** in. deep x **7** in. wide; block screen **120**.

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